AUXILIARY INSTALLATIONS EQUIPMENT FOR CONSTRUCTING MOZU-BESM II

- USSR -

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The development of memorizing (storage) constructions based on magnetic cores calls for auxiliary equipment, incorporating stands for quality control of these cores, and for the checking of constructed units of magnetic parts, namely:

1. Automatic stand for the quality control of the cores of the memorizing part of the MOZU.

2. Stand for quality control of the coordinating part of MOZU.

3. Stand for checking of finished coordinating transformers.

4. Stand for the checking of magnetic plates.

The equipment described in this article has been developed in the laboratory of universal machines ITM and VT bearing in mind its application to laboratory. Participating in this work were B. N. Vishnevetskaya, S. I. Starikova, V. M. Starikov, and A. A. Frolova. The automatic stand for quality control of the cores was developed by the designer A. A. Gryzlov. This automat has been built by the experimental shops of ITM and VT of the Academy of Sciences USSR.

I. The method of quality control of magnetic cores used in MOZU.

The memorizing constructions based on magnetic cores use a very great number of cores with identical characteristics. The problem of the correct quality control of these cores for a given type of ZU becomes extremely important. The method elaborated for the quality control of the cores intended for use in MOZUs of the Z type consists in checking their reliability under conditions corresponding to those existing in their work in a MOZU under a normal routine of work.

MOZUs of this type make use of two forms of magnetic cores: one form serves in the memorizing part of the equipment, the other in the coordinating part of it. In each case the quality control demands are specific.

1. Methods of quality control used on cores of the momorizing structure of MOZU.

Cores made of ferrite and marked VT-1 are used as memorizing

elements of the structure. Their dimensions: OD = 2.00 $\pm$ 0.05 mm. ID = 1.35 $\pm$ 0.05 mm. height 0.90 $\pm$ 0.05 mm. Cores of wrong dimensions are scrapped.

Working in a MOZU, the memorizing cores can take part in one of the three specific runs, depending on the current acting on them.

1st run: under the action of the summary current* $I_Z + I_X$

These are the conditions encountered by the cores of the scale of the number chosen.

2nd run: the acting current is a sum of $I_{Z_{II}}$ and I_X

These are the conditions encountered by the cores of the number scales of the semi-excited coordinating transformers.

3rd run: The cores are under the action of the current I_X.

Under such conditions all the other cores of MOZU are working. The following demands are put to the memorizing cores of MOZU.

1. Counting the momorizing cores of the selected number must be sending signals, the spread of which is kept within the limits indicated in technical conditions (see below).

2. These cores must not lose their magnetic state under the action of the currents I_X or $I_{Z_{II}} + I_X$, since this would entail the voidance of the information memorized in ZU.

Figure 1 shows the oscillograms of the currents acting upon the chosen core. Counting takes place under the action of the current I_{Z_I}, while under the action of $I_{Z_2} + I_X$ the core records "1". The induction change of a core depends on its hysteresis loop. Cores having different loops, yield counting signals of units of different magnitudes and shape, Analogously, the induction change under the action of the current $I_{Z_2} - I_X$ (record zero) depends upon the steepness of the hysteresis loop in the 2nd and 4th quadrants. Consequently the signals of count "zero" will also be different.

In addition, each core is characterized by the limit value of the permissible external field, such as would cause no magnetic reversal of the core. With a frequent action of current pulses upon a core, developing an external field of an intensity within the limits allowed, the point, characterizing the magnetic state of the core, develops its own closed cycle and the process becomes stable.

Should the intensity of the external field go beyond the limit value permitted, the "working point" will move in an open cycle continuously moving away from the starting position, and this leads to a slow alteration of the polarity which means a subsequent destruction of the momorized information. Most unfavorable from the viewpoint of stable retension of the information by the MOZU

*Notations encountered in this article correspond to those used in the description of MOZU [1, 2].
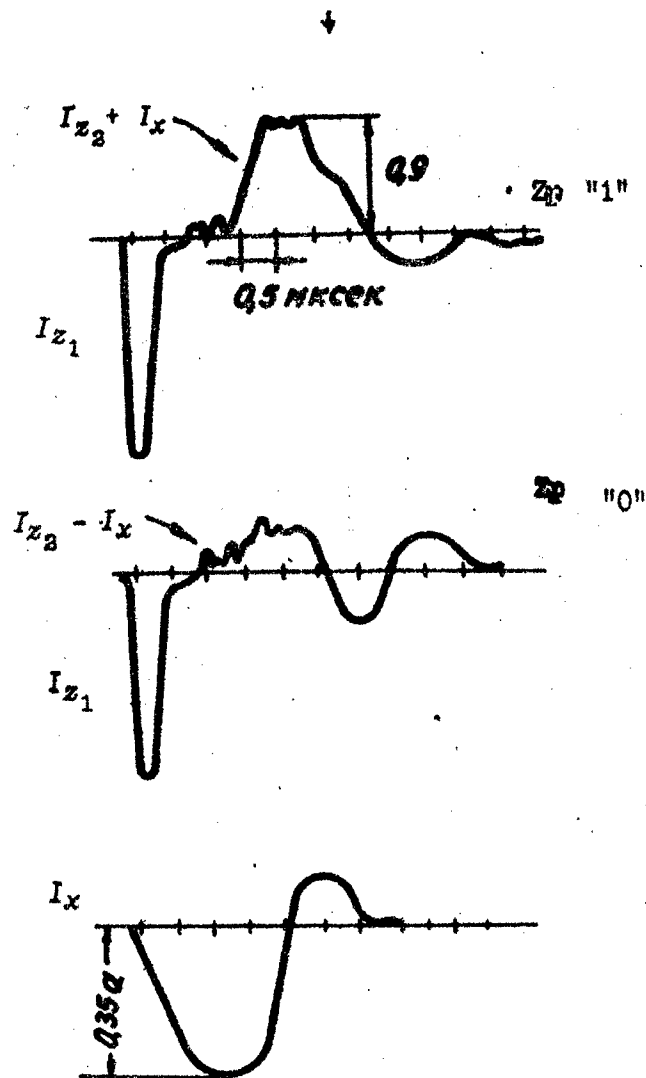
Figure 1

are the cases where the core is subjected to the uni-polar current of recording pulses I_x, giving in the opposite direction from the previous recording.

Thus checking of the cores takes place under a sequence of currents I_z and I_x presented in Fig. 2. The diagram shows that upon recording in the core: "1" or "0", the recording current changes its polarity. It has been established by experiments that it is sufficient to repeat the current of the same record four times in order to check a core for its stability as a keeper of information. But the amplitude values of the acting currents are chosen in such a way as to exceed those in the normal run of a MOZU. In the run of the test the conditions of recording "1" and "0" are made worse, and the amplitude of the currents that cause the destruction of information is increased. The shape of the current pulses

acting upon the memorizing core must correspond to that occurring in the normal run of MOZU.
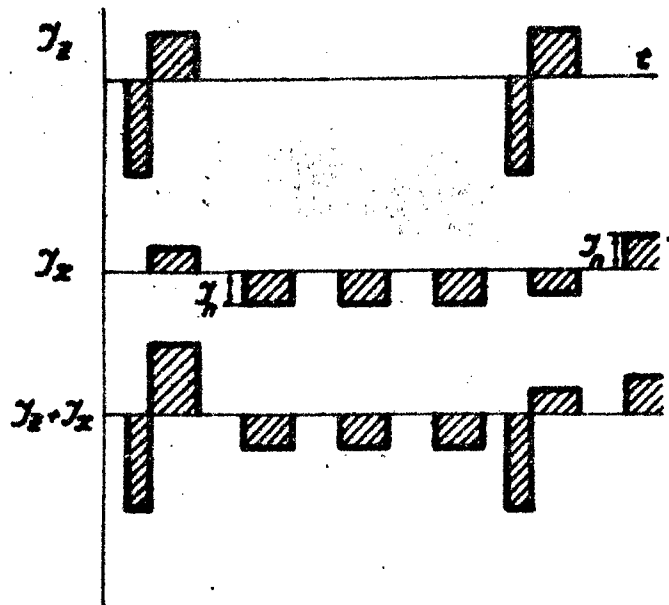

Figure 2

For these reasons the specifications call for a definite period of the growth and of the duration of the pulses of current passing through the core which is being checked.

It follows from the above that the memorizing cores work under impulse conditions which cannot be fully characterized by the static hysteresis loop of the core's material.

Taking a record of the hysteresis loop in a dynamic process embodies a complicated and laborious process and cannot be recommended as a means of quality control of the cores. The evaluation of the dynamic characteristic of the core is made by using the exit-signal traced for that core. The way in which the tested core and the standard one are compared permits to judge about the similarity of their dynamic characteristics. The methods of testing for quality the ferrites intended for MOZU permit to divide the cores into groups with their dynamic characteristics within definite limits.

Once the basic features are kept within a given limit of spreading (as stated in specifications), the magnitude of the exit-signals also remains within proper limits.

The values of these characteristics and of their deviations, as given in tables 1 and 2 in the specifications, have been established on the basis of the demands of reliability put to MOZUs. Statistical data, obtained in the measurements of large batches of cores, produced by the laboratory of magnetic parts ITM

and VT, were also taken into consideration.

Technical conditions for the quality control of the ferrite cores of the momorizing part of the magnetic plate of MOZU:

1. The control must be performed on a special stand (described later on).

2. Amplitude and shape of the currents sent through the tested core must correspond to those given in table 1.

Table 1

Currents	Amplitude	Durations of head-front. microsec.	Durations of current microsec.
I_{z_1}	1,7 ± 10%	0,15 ± 10%	0,7 ÷ 0,8
I_{z_2}	0,7 ± 10%	0,4 ± 10%	1,3 ÷ 1,5
I_x	0,3 ± 10%	0,4 ± 10%	1,3 ÷ 1,5
I_n	0,45± 10%	0,4 ± 10%	1,3 ÷ 1,5
3n"1"	0,95± 10%		
3n"0"	0,45± 0,5		

Notes: 1. Duration of head-front is measured for the levels of 0.1 to 0.8 of the amplitude.

2. Duration of the pulse is measured upon the level .1 of the amplitude. The current oscillograms must correspond to those of Fig. 1.

3. Signal of count "1" per core must lie within 0.6 - 0.8 volt. The ratio of signal "1" to signal "0" must not be below 10. Cores not satisfying this condition are to be scrapped.

4. The cores tested must be placed in a number of groups. The signal deviations in each group must be no greater than 5 - 7 percent.

A sample of signal ratios per group is given in table 2.

Table 2

	Groups	
	I	II
U_{exit}	0,65 ± 0,05в	0,75 ± 0,05в

6. Cores of different groups cannot be put in one magnetic plate.

Figure 3

2. Description of stand-automation for quality control of cores.

Set-up of the programmer part of the stand.

A sketch of the set-up of stand-automaton for the quality control of the cores of MOZU is given in Fig. 3. The programming part of the stand insures the necessary sequency of the current pulses sent to the core being tested. Pulses of the currents I_{Z_1} and I_{Z_3} are transmitted from the coordinating transformer to the number scale and into the core being tested. Program of checking the core is organized in such a way as to insure the actual work of the identical core with its work in ZU. For this purpose the pulses sent in are such as to record the codes "1" and "0", and in the intervals between them are sent pulses of current I_n which check the core's resistance to voidance of the information.

The time diagram of the currents entering into the core tested is shown in Fig. 4. In order to insure a certain reserve of reliability of the cores in resisting pulses that destroy the record, pulses I_n is introduced between the currents $I_X + I_{Z_2}$ and $I_Z - I_X$. The amplitudes of these pulses are greater than the one of the current I_X, which serves directly for recording.
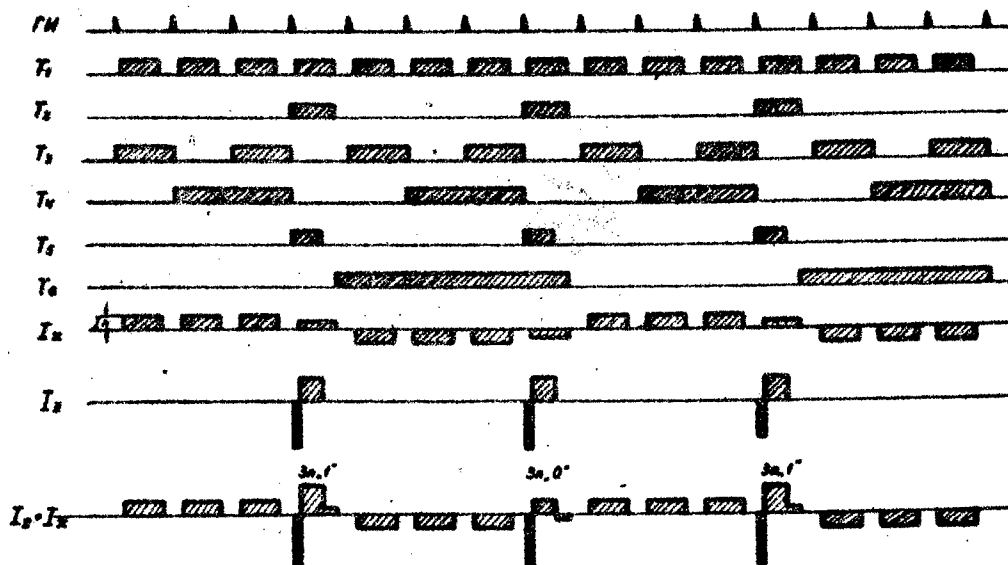

Figure 4

The set up of the programmer part consists of the pulse generator GI, valves, triggers, delaying lines, and pulse formers F_z and F_y. The generator works on a frequency of 10 kilohzts, and its pulses pass through the valve V_2 to the entrance of the double counter, operating the triggers T_3 and T_4. At the exit from the counter stands the trigger T_5, which forms rectangular pulses lasting one microsecond for the work of the former F_z. The impulse passes through the valve V_9 into the entrance U"0" over the delaying line LZ_2 and valve V_8. From the exit "0", the gradient of the trigger T_5 becomes differentiated, and, through the valve V_{10} and the delaying line LZ_4 it enters into the counting entrance of the trigger T_6. This trigger controls the valves in the formers F_x. Depending on the position of this trigger, both the number scale and the core tested will record "1" or "0". Thus the core being tested will get the records "1" and "0" alternatively.

Simultaneously with the putting of trigger T_5 into position "1", the putting of trigger T_2 into the same position takes place. This trigger uses the block UF in order to regulate the current I_n at the moment of recording. Block UF represents an amplifier of the constant current and forms a part of the circuit of the screening net of the existing cascades of block F. When the trigger T_2 happens to come into the position of the code "1", UF passes the current, the voltage on the screening net of the former F drops, and the number scale gets the current I_x, the amplitude of which is smaller than the one of the current entering the number-scale in the interval between "1" and "0".

The secondary entrances of the formers F_x are controlled by the trigger T_1, which like the trigger T_5 forms rectangular voltages pulses with the aid of valves V_4, V_3 and V_5 plus the delaying line LZ_3. Pulses coming out of the trigger T_1 last approximately 1.5 microsecond. The pulse formers F_x and F_z serve the number scale with corresponding equivalent loadings. In order to form the current I_{z_2}, the exit winding F_z of the coordinating transformer carries damping diodes. The switching on of the programmer part of the stand is performed by corresponding cam of the automaton K_2. This is accompanied by putting a voltage of 100 volt upon the secondary entrances of the valves. The time diagram of the programmer part of the stand is presented

in Fig. 4.

The measuring part of the stand.

The core are checked on the stand by the method of compensation. Signals taken from the core being tested are compared with those taken from a standard core. Their processes are identical because the same current pulses pass through both. The difference between the signals of the core being tested and those of the standard one supplies the measure of the identity of their magnetic characteristics under the pulsating current. The difference between the signals must not exceed a certain limit set beforehand otherwise the core being tested is scrapped.

The electric system that operates the comparison and scrapping of the cores consists of an amplifier that can work as a linear (U) amplifier, or as a paraphase amplifier (PU), plus as a combination set-up operating on the valves V_{13} and V_{14} which work on a common load, plus a final amplifier OU, a trigger T_7 and an electronic relay composed of a tyratrone TG and a relay.

Contacts of the cam K_4 bring the difference between the tested and the standard core into the entrance of the amplifier. Usually the cam K_4 keeps the contact closed and the amplifier is grounded. Thus the inductions on the entrance to the amplifier U_2 do not enter the measuring circuit. K_4 breaks the contact at the moment when the pin carrying the core which is being checked closes the contact in the circuit of the number scale and a sequence of working pulses through the core. The number scale gets the signal of the difference in the emf. of the two cores. Variable resistances R_1 and R_2 regulate the sensitivity of the measuring circuit.

Should the signal of emf. difference indicate an excessive value, a pulse signal appears at the exit of the final amplifier and brings the trigger T_7 into position "1". The relay circuit becomes broken and its electromagnet (EM) remains inoperative. The next move of the pin throws the tested core into the funnel of the classifier and a tubulus deposits in the bunder (1).

If the emf difference between signals is lower than the permissible figure, it means that the checked core is practically identical with the standard one and the trigger T_7 will remain in the position of the code "0". It is brought into this position by the GI pulses previous to each measurement through the contact of the cam K_1 and by the valve V_{12}. After a certain time the cam K_3 closes the contact in the circuit of the electronic relay ER and the relay's operation closes the contact ERa. The

electromagnet EM pulls in its anchor and sets the distributor in such a position that it will let the core pass into the bunker No 2, intended for the cores identical in their qualities with the standard ones.

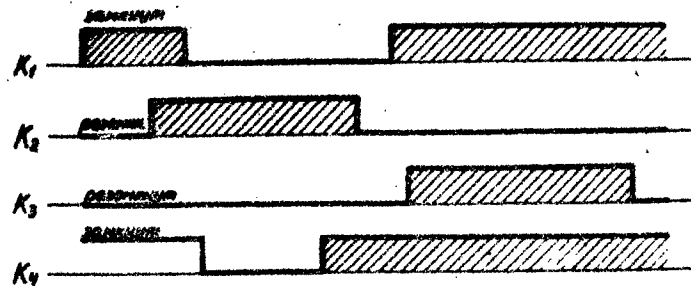Diagram of the operation of the cam mechanism is shown in Fig. 5.

· Figure 5

An electro-mechanical counter EMS is switched in series with the electronic relay. This counter records the number of the relay's cooperations and consequently the number of satis- factory cores.

A special compensating core is set up in the circuit measuring the emf differences. It compensates for the distur- bance caused by the current's flow through the contact's RK resistance.

3. Methods of classifying the cores for the coordinating part of MOZU.

The cores of the coordinating transformers are built of ferrite and are marked K 28. Their dimensions: OD 3.00 mm; ID 2 mm. thickness 1-1.2 mm. deviating cores are scrapped.

Under the working conditions of MOZU, the most important characteristics of the coordinating transformers are the depen- dence of the exit signal on the field intensity curing the pulse and the ratio of the valid signal to the disturbance. Under the accepted method of selection of the cores for these transformers, the above mentioned characteristics are measured in working conditions approximating those in MOZU.

The exit signals recorded for definite values of the entering currents serve as the indexes of identity of dynamic characteristics of the cores. The process of checking the cores intended for these transformers is given in Fig. 6. The first pulse fully alters the polarity of the core, provided the active field intensity is sufficiently high. In our case the factor $m = H/H_c$ is approximately $= 3$. The second pulse produces
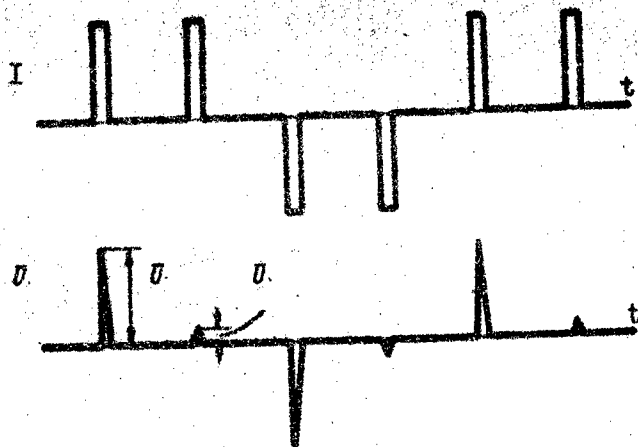
Figure 6

a partial change in the induction and the exit winding shows the signal of disturbance. The voltage pulses in the exit winding of the core being tested are also shown in Fig. 6.

Technical conditions for classifying the ferrite cores in the coordinating part of the plate of MOZU.

1. The classification of the cores is performed on a special stand described below.

2. Intensity and shape of the current passing through the core under testing conditions are given in table 3.

3. The cores are divided into three classes following the data in table 4.

Table 3

Amplitude, α	3 ± 0,15
Duration of pulse in microsec.	1,5 ± 0,1
Duration of the heat front of the pulse in microsec.	0,2 ± 0,05

Notes: 1) The duration of the pulse is measured on the level pf 0.1 of signals amplitude.
2) Duration of the head-front of the pulse is measured on the level of 0.1 to 0.8 of the amplitude's value.

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Table 4

	Number of group		
	1	2	3
U_{acting} in volt	> 2,2	> 2 < 2,2	< 2
$U_{disturb.}$ in volt	< 0,2	< 0,2	< 0,2

In the construction of the coordinating transformers the cores of the first and second groups are used.

4. Description of the stand for classifying the magnetic cores for the coordinating part of MOZU.

Fig. 7 shows the scheme of the set-up for controlling the stand. Basically the stand is built on standard blocks of BESM [2].
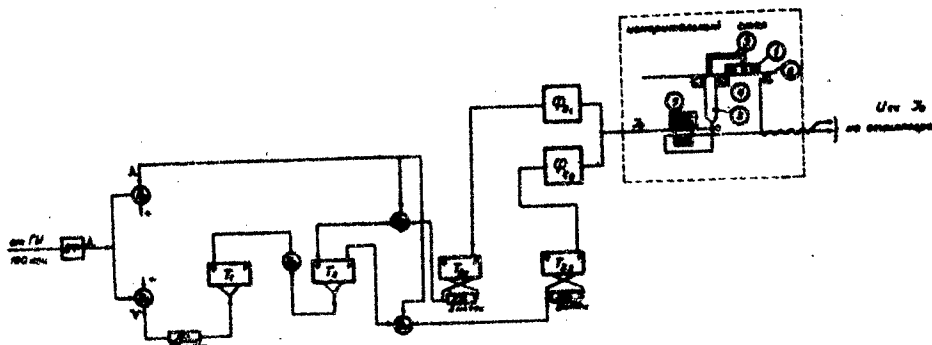

Fig. 7 Scheme of stand's control
1. The core to be checked; 2, 3 current leading bridge and bar; 4. insulating disk; 5. compensating core; 6. the grounded surface of the table.

The pulses come from a generator (GI) working on a frequency of 100 kilohertz; they enter a double counter composed of triggers T_1 and T_2. These triggers produce the rectangular pulses with duration of 2 microsec. The pulses enter into the formers F_{Z_1}' and F_{Z_2}'. These are somewhat different from the standard blocks F_Z used in MOZU. The principle of these blocks F_{Z_1}' and F_{Z_2}' are given in Fig. 8. The exit pulses of the formers

agree in amplitude and form but differ in phase.

Time diagram of the sequence of pulses and individual points of the set-up are shown in Fig. 9. The scheme of switching on of the core to be tested to the programmer of the stand (Fig. 7) shows that the core stands under the action of the summary currents from the formers F'_{Z_1} and F'_{Z_2} .

Compensating core 5 serves to lower the disturbing effect which takes place when the current flows through the transfer contact before reaching the oscillograph.
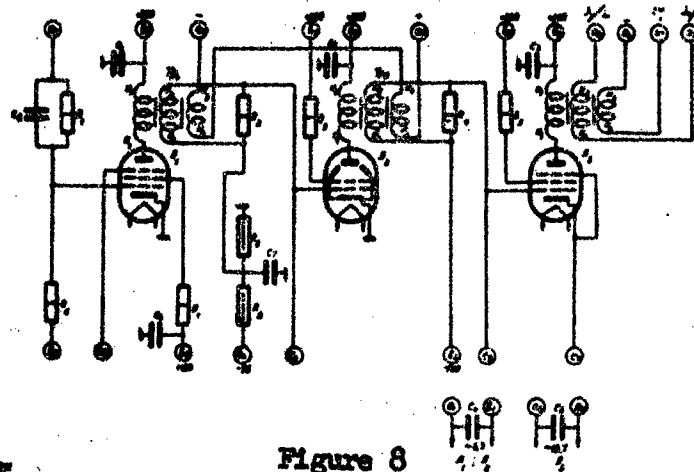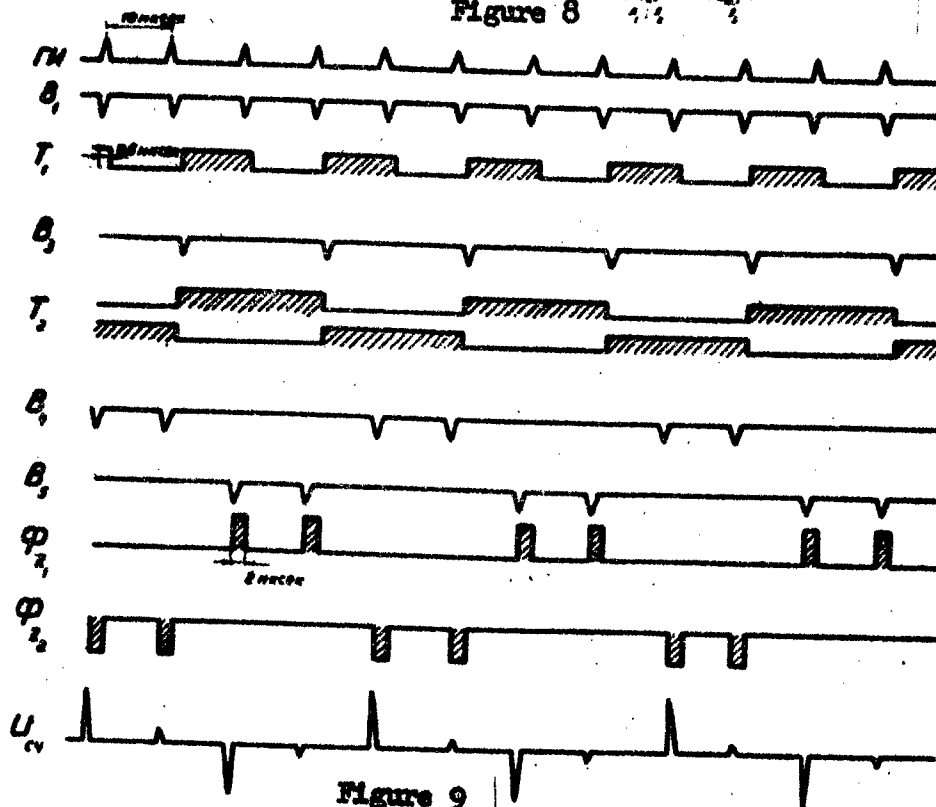

Figure 8

Figure 9

— 13 —

On closing the switch 2, a single turn forms which passes through the core being tested. This turn receives the pulse of the current and the emf to be measured is induced in it. The counting signals are taken from the point "a" and are observed on the oscillograph's (type 25-I or 10 4) screen.

The process of the operation on the stand.

With the stand switched on, the circuit must be closed by using the snap switch 2. The disturbance on the oscillograph's screen must not exceed 50 mv.

2. The snap switch is replaced by a calibrated resistance $R_K = 1$ ohm. The current's intensity is checked. It must correspond to the data of table 3.

3. The stand itself is checked by means of standard cores of groups 1, and 2.

The values of the signals obtained from these cores on sending the specified current must correspond to those given in table 5.

Table 5

Amplitude	$3 \pm 0,15$	
Duration, microsec.	$1,5 \pm 0,1$	
Duration of the head-front, in microsec.	$0,2 \pm 0,05$	
U active (volt)	$2,2^{*}$	2^{**}
U dist. (volt)	$0,2$	$0,2$

*in table 5 corresponds to the first group.
** to the second.

The further work is expedited by plotting marks upon the oscillograph's screen which correspond to the signals of the standard cores of groups 1 and 2.

The checking of the signals sent by standard cores must be performed every hour and in every case if inaccuracy of the work of the stand is suspected.

5. The classifying of cores into three groups proceeds in accordance with technical specifications. To expedite the work of classifying, the oscillograph's screen is provided with control lines corresponding to the three groups as shown in Figure 10.
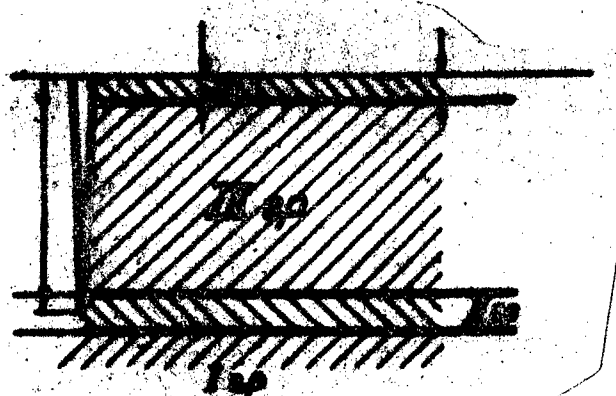
Figure 10

II Stand for checking the finished nodes of magnetic elements

1. Stand for checking the completed coordinating transformers.

The cores of coordinating transformers are formed from the ferrite rings previously selected on stand No. 2.

The coordinating transformers are checked after they have received the entrance and exit windings. Other windings (the second entrance winding and the winding of the shift) are put upon the transformer when the latter is being installed into the plate. Thus it carries only two windings while being checked.

The checking proceeds under conditions duplicating the usual ones in their work in the MOZU, under which the windings of the transformer carrying a normal working load, receives currents corresponding to the terms of technical specifications.
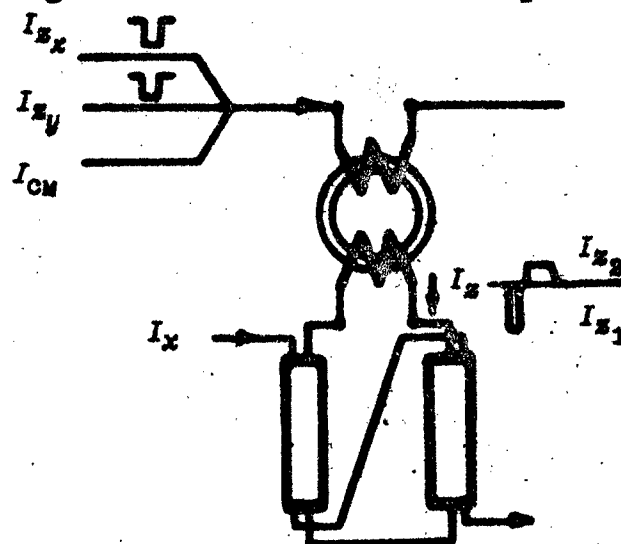

Figure 11

Specifications for the checking of finished coordinating transformers.

The checking of a transformer proceeds in two stages.
1. Checking of the exit current I_z and the disturbance current I_{z_h}.

2. Checking of the counting signal coming from the standard core.

In this checking, the transformer to be checked is being compared with a standard transformer.

Table 6 presents data characterizing the current pulse coming from a standard transformer.

Table 6

Entrance current $I_{z_y} = I_{z_x}$		Exit current I_z	
Amplitude a	$2\pm0,1$	Amplitude of I_{z_1}, a	$1,8 \pm 0,1$
Duration of current I_{z_x}, I_{z_y} in microsec.	$1\pm0,1$	Duration of current I_{z_1}, in microsec.	$0,9 \pm 0,1$
Duration of head front, in microsec.	$0,15\pm0,02$	Duration of front I_{z_1}, in microsec.	$0,2 \pm 0,02$
Duration of the descent of the pulse, in microsec.	$1,5 \pm0,15$	Amplitude of I_{z_2}, a	$0,7 \pm 0,05$
Current of the shift I_{CM}, a	$4,5 \pm0,3$	Duration of the in microsec. I_{z_2},	$1,5 \pm 0,03$
		Amplitude of disturb. I_{z_n}, a	$0,02\pm 0,002$

Notes: 1. Duration of front of current is measured between the levels 0.1 to 0.8 of the amplitude.
2. Duration of the pulse of current I_{z_x} (I_{z_y}) is measured at the level 0.8 of the amplitude.

Table 7 shows the data for the signals taken from a standard core.

Table 7

Amplitude of the signal counting "1" U_{1_9}, мв	750
Amplitude of the signal counting "0" U_{0_9}, мв	80

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Checking of completed coordinating transformers is done on a special stand.

During the checking the windings of the transformer receive a sequence of current pulses corresponding to the normal run of the work of MOZU under a regular working frequency. And since this sequence is identical with that used in the selection of the memorizing cores, the set-ups of the stands are identical to a great extent.

Fig. 12 shows the time diagram of the currents and Fig. 13 shows the set-up of the stand's control, which makes these diagrams possible. Since the set-up of Fig. 13 is nearly the same as the one of the control of the stand-automaton, its detailed dexcription is not given.
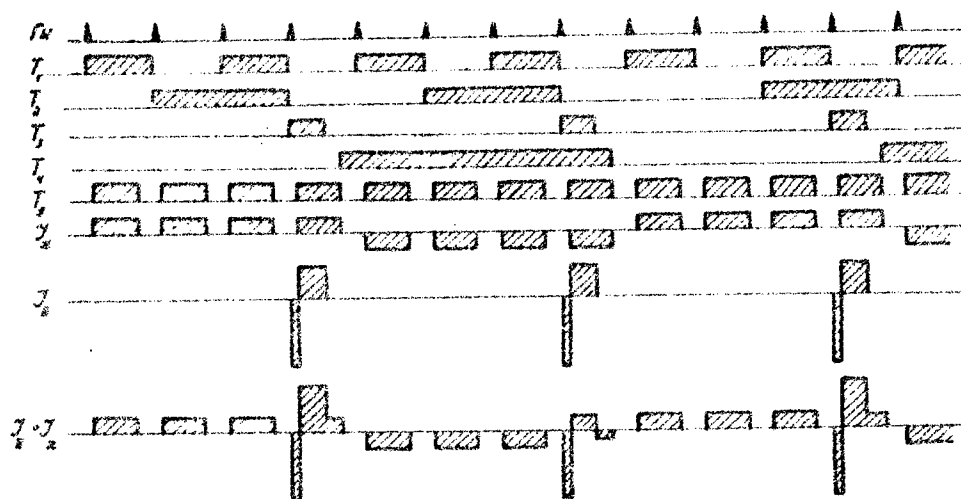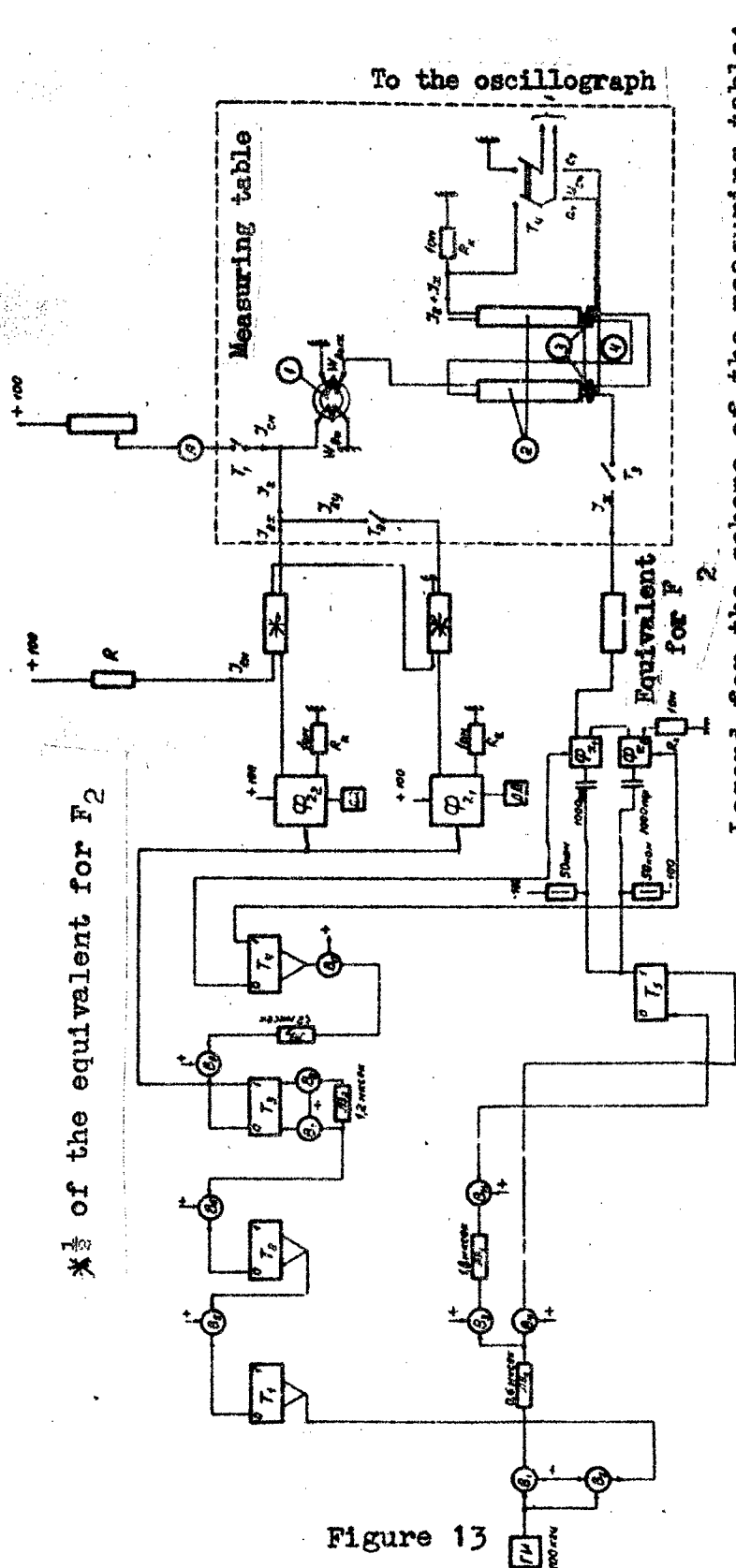

Figure 12

The currents I_Z and I_X come from the control set-up to the measuring table of the stand and the transformer to be checked is connected to the table's terminals. The entrance coil of the transformer gets the sum of the currents I_Z and I_X plus the current of the shift.

The currents' intensity is controlled by calibrated resistances $R_K = 1 \pm 0.02$ ohm. The intensity of the shift's current is adjusted by the ammeter and controlled by rheostate.

The entrance coil of the transformer gets a load corresponding to the normal operation of the transformer, which amounts to running a scale of fifty pairs of memorizing cores.

The counting coil (4) serves to take off the signal U_{count} from a standard pair of cores.

Figure 13

To the oscillograph

Measuring table

Equivalent for P

$*\frac{1}{2}$ of the equivalent for F_2

Legend for the scheme of the measuring table:
1. The coordinating transformer to be checked.
2. The load equivalent of that transformer, (constructively connected with F_2).
3. Pair of standard memorizing cores.
4. Windings of the counting.

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Method of the stand's operation

The stand itself must be checked for its precision before proceeding to check the transformers.

1. Having established the proper current intensities I_Z, I_X and I_{shift}, according to table 6, one must examine the pulse of I_Z at the entrance of the standard coordinating transformer. Having taken the I_{Z_X}, one must examine the pulse of disturbance at the exit of the same transformer. Both pulses must be marked upon the oscillograph's screen or on tracing cloth, and they will serve for controlling the stand.

2. The counting signals of the standard core must be checked.

3. The transformers to be checked must be switched to the measuring table's terminals; having switched on the currents I_{shift} and I_{Z_Y}, then I_{Z_X}, we compare the signals at their exit with those of the standard transformer as marked upon the oscillograph's screen.

Should transformers produce a current I_{Z_n} greater than the standard current or the current I_Z lower than the standard one, such transformers must be rejected.

4. Having switched on the recording current I_X one must check the value of the signal U_{count} from the standard core.

Transformers giving counting signals U_1 $U_{1_{st}}$ and U_2 $U_{2_{st}}$ must be rejected.

2. Stand for checking the magnetic plates.

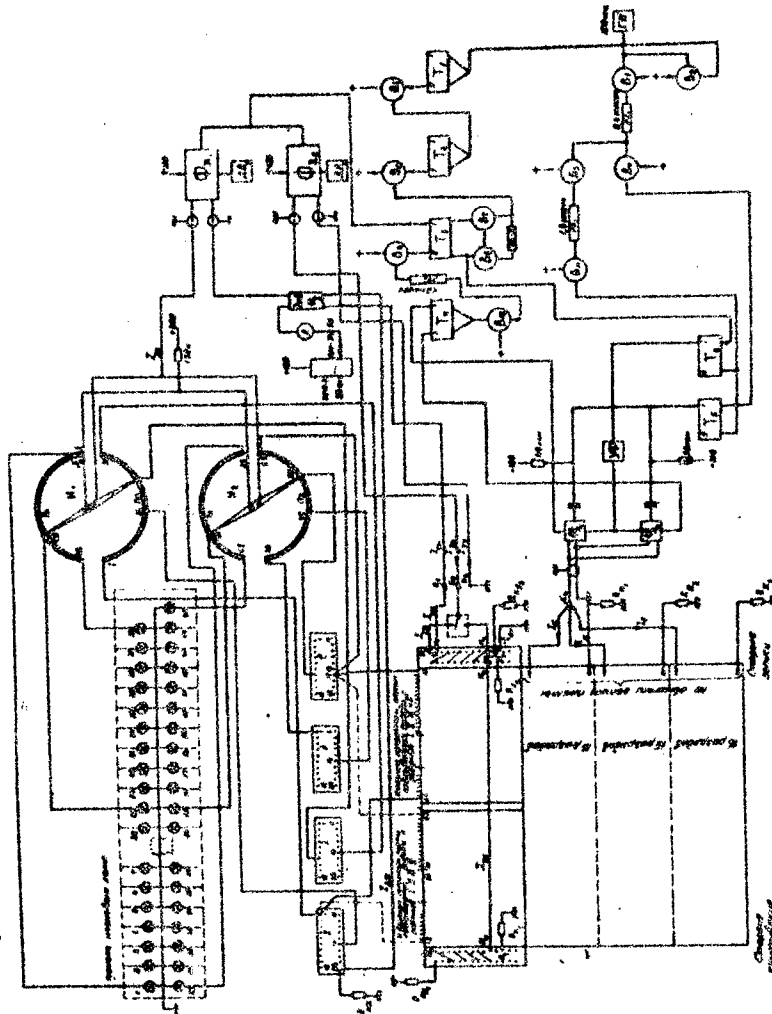The finished magnetic plate must be checked first of all
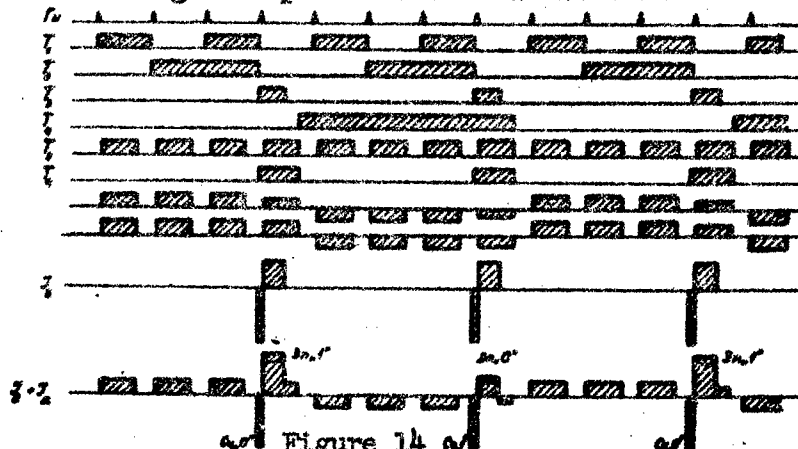
Figure 14

Figure 15

for the strength of its electric insulation according to technical
conditions (the latter are not given in this article).

Then the magnetic plate is checked for its working ability
on a special stand in two specific ways. In both, the sequence
of the currents sent through the coordinating transformers and the
memorizing cores corresponds to that approaching the normal opera-
tion (2nd check), and to the abnormal operation (first check) of the
run of the MOZU.

The run of the first check corresponds to the run of the
operations in selecting the cores for MOZU, which means that the
conditions of recording "1" and "0" are made abnormal, and the
amplitude of the current I_n that might lead to the voidance of the
record is raised.

The time diagram of the currents entering the plate is given
in fig. 14. The set-up of the control of the stand, built of
standard electronic blocks BESM, insures the proper sequence of
pulses corresponding to the time-diagram. The complete set-up
is presented in Fig. 15. This set-up is identical with the one
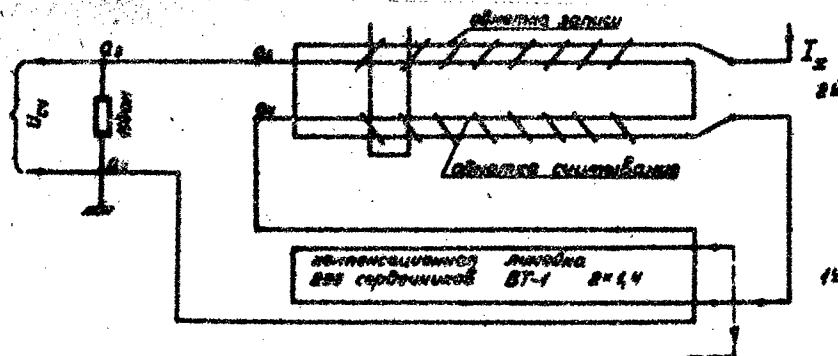of the programmer of the stand-automaton.

Figure 16

The scheme of the stand's control is given in the right
side of the drawing; the left side of the drawing shows the table
to which the magnetic plate is fastened and the system of finders
insuring the switch over of the entering pulse of number selection
for all the numbers of the plate. Since these finders have 65
positions, while the plate carried 130 digits, the right and
the left sides of the plate are checked in sequence.

The currents at the plate, I_{Z_X}, I_{Z_Y} and I_X are shown in

the diagram. In series with the former F_{Z_X}, which supplies the

pulses selecting the numbers of the plate, an equivalent, imitating

the true load of the former, is switched. The load upon the formers F_z and F_X is close to the practical one and for this reason no supplementary equivalents are necessary. In order to compensate for the disturbance current coming from the recording current upon the counting coil there is a supplementary load scale consisting of 100 cores. It is switched in series with the discharge which is being checked as shown in Fig. 16.

Technical Conditions for Checking the Magnetic Plate

The checking of the magnetic plate for its working ability is performed on a special stand in two different runs. The magnitudes of the working current and of the shift current for these runs are given in table 8.

Table 8

	Number	
	1	2
Duration of impulse of current $I_{Z_X} = I_{Z_Y}$	2a	2a
	1 microsec	1
Duration of front of currents	0,15	0,15
Duration of the descent of I_{Z_X}, I_{Z_Y}	1,5	1,5
	4,75	4,5
Shift current I_{CM}	0,3a	0,35a
Current of record I_X (amplitude)		
Duration of pulse of current I_X	1,5	1,5
Duration of the front of current I_X	0,5	0,5
Current I_n (amplitude)	0,45a	0,4
Duration of pulse of current I_n	2,0	2,0
Duration of the front of current I_n	0,5	0,5

Note: Duration of pulse of I_{Z_X} (I_{Z_Y}) is measured upon the level of 0.8 of the amplitudinal value; duration of the front is measured between the levels of 0.1 to 0.8 of the amplitudinal value. Duration of the descent is measured between the levels 0.8 - 0.1 of the amplitudinal value.

The first check of the magnetic plate is performed on the first type of run. The exit signals from the counting coil of each discharge are switched to the oscillograph in due order. Signals of counting "0" and "1" are checked on the oscillograph. Signals coming from cores with amplitudes less than 400 mv are entered in the usual passport of the magnetic plate. The passport carries the position of the core and the amplitude of its signal.

After checking, all cores marked in the plate's passport must be eliminated. Upon repair, the plate passes through a second check in the second type of run. The plate is considered ready for the MOZU if the cores with amplitudes less than 400 mv produce no signals. Should the second running check discover cores with signals from current of amplitudes less than 400 mv., the plate must undergo a second repair process with a subsequent check in the second type of run. Should the first check indicate the absence of such cores, the second check on the second type of run becomes non-obligatory.

Method of Checking the Magnetic Plate.

1. Before checking the plates the stand itself must be checked for the precision of its controls. The currents delivered to the plate are first adjusted by using calibrated resistances of 1 ± 0.02 ohm. The pulses of voltage at the terminals of these resistances are examined on the oscillograph's screen.

a) Parameters of the entering currents must correspond to the data of table 8. The proper shape of the pulses is shown in Fig. 17. The shift current is adjusted by rheostates on the ammeter's indications.
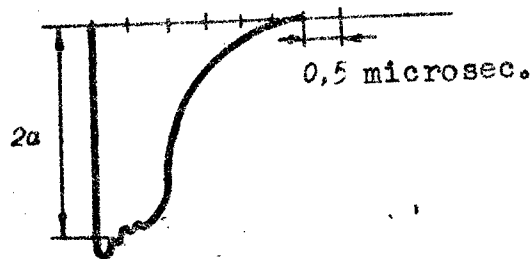

Figure 17

b) current pulses on the exit coil of the coordinating transformer are controlled by resistances R_{K_1} (this corresponds to the first number on the left half of the plate), and by resistances R_{K_2} which corresponds to the right half of the plate.

The sum of the current pulses $I_Z + I_X$ on the resistance R_{K_1} (or R_{K_2}) is obtained by connecting the terminal of the coil of record to the point a_1 (or a_2).

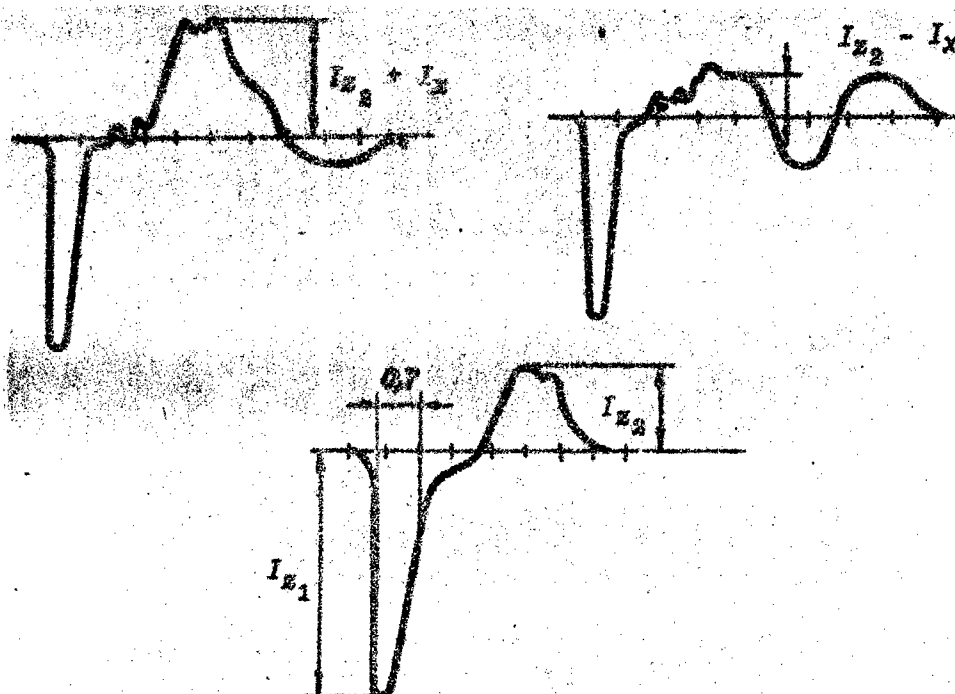The shape and parameters of the pulses in the points a_1 (or a_2) are shown in fig. 18 and in table 9.

Figure 18

The plate can be checked only after a complete adjustment of the types of run with the types of control runs for the first and second checking processes given in table 9.

During the checking of the plate the current of selection passes through all the coordinating transformers of the plate. The selection is done through a finder, actuated by a relay, which is controlled by a desk button. A neon tube shows the selected number of the plate. The tube is fixed on a board placed in the upper part of the desk.

Exit signals taken for each discharge from the counting coil are consecutively switched to the entrance of the oscillograph type 10-4 (Fig. 16). The synchronizing of the oscillograph must be arranged in such a way that the signals of counts "1" and "0"

could be simultaneously observed on each discharge of each number. The minimum value of the signal below which the core has to be replaced by another is established by the specifications for plate checking.

Each magnetic plate must have a passport stating its number, date of checking (1st and 2nd) and the name of the checker.

Table 9

Amplitudinal values of the currents, a		Types of run	
		First check	Second check.
I_{z_1}		1,8	2
I_{z_2}		0,65	0,75
I_x		0,3	0,35
I_n		0,45	0,4
$I_z + I_x$	1 first half-wave	1,6	1,7 ÷ 1,8
	2 second half-wave	0,95	1,1
$I_z - I_x$	1 first half-wave	1,6	1,7 ÷ 1,8
	2 second half-wave.	0,4 ÷ 0,45	0,35

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END